Rejections under 35 U.S.C. §103

Claims 1-17 were rejected under 35 U.S.C. §103 as being unpatentable over Armitage, U.S. Patent No. 6,347,303 in view of Aggarwal, U.S. Patent 6,330,614.

U.S. Patent 6,347,303, Armitage:

Armitage describes a negotiative protocol by which Label Switched Paths (LSPs) can be explicitly established using a defined distribution protocol. Portions of a label are defined by an upstream neighbor in an adjacent pair of LSRs by having the upstream neighbor provide a bit mask, indicating which portions of the label are to be assigned by the downstream neighbor. If all bits of the bit mask are zero, the label is fully determined by the upstream neighbor, otherwise any bit in the mask is et-able by the downstream neighbor. (see Armitage, col. 1, lines 37-45)

U.S. Patent 6,330,614, Aggarwal:

Aggarwal describes a technique for reusing the checksum field space in the header in the current Internet or private IP networks for increasing the processing speed of Internet datagrams. Aggarwal describes combining a group of Router ins into Autonomous Systems (AS), and assigning the same unique number to all routers in the system (col. 11, lines 41-43). The AS field is stored in the checksum field, and core routers forward datagrams by using the AS number stored in the checksum field, *in addition to the regular IP address* of the network device. (Since the AS field is used to designate a group of routers, some sort of address space is still required to identify the destination device in the AS). [See col. 5, lines 26-28 "... the present invention, unlike the currently advanced IPv6 and MPLS proposals, provides for keeping the current header size..."

The Examiner states, at pages 1-2 of the office action:

"... Armitage teaches a system/method related to using LDP to establish label switched paths, including

mapping, associating correlating or binding a first (routing) label from an upstream neighboring device to a seconed (routing) label from an downstream neighbor ... (col. 10, lines 52-59, col 10 lines 64 col 11 line 5)

receiving from said upstream neighboring device a protocol message including said first label (col 3 lines 34-38)

swapping said first label with said second label ... (col 16/lines 17-33) and

forwarding said protocol message to said downstream neighbor ... (col. 3/line 34-38)...however the prior art of record does not explicitly teach wherein an upstream and downstream neighboring devices are in a respective first and second autonomous system...

Aggarwal teaches a system/method related to Label Distribution Protocol ... teaching combining neighboring devices into autonomous systems and assigning a unique number to each system (col 11/lines 40-51), wherein a first label from an upstream neighboring device ... is mapped to a second label from an downstream neighboring device ... It would have been obvious to one of ordinary skill in the art at the time the invention was made include autonomous system using the network address assigned number to support multiple networks interconnected via edge and core router devices, as suggested by Armitage..."

Motivation neither shown nor suggested by the references

In order to support a rejection under 35 U.S.C. §103, a motivation for the modification suggested by the Examiner should be shown or suggested in the references. However, Applicant's can find no such support. Although the Examiner states that it would have been obvious to include Autonomous Systems into the ideas put forth by Armitage, it should be noted that Aggarwal specifically states, at col. 5, lines 25-26 ".. the current invention ... looks very similar to the MPLS structure and thereby enables elimination of a need for MPLS..." Aggarwal also specifically details the problems with using any type of label distribution protocols at col 8, lines 60 – col. 9 line 3. Accordingly, since no motivation to combine the references can be shown or suggested, and since, in fact, Aggarwal explicitly teaches away from the use of LDPs, the rejection under 35 U.S.C. §103 has been overcome and should be withdrawn.

Combination neither describes nor suggests the claimed invention

Assuming, however, that a motivation can be found for the modification suggested by the Examiner, Applicants submit that the combination of references neither describes nor suggests the limitations of the claims.

Claims 1-5:

For example, Claim 1 recites the steps of "...mapping a first label from a first autonomous system to a second label in a second autonomous system ... receiving from said first autonomous system a protocol message including said first label ... replacing said first label

with said second label in said protocol message; and forwarding said protocol message to a downstream neighboring (next hop) device in said second autonomous system..." Applicants submit that such a claim is neither describes nor suggested by the combination of Aggarwal and Armitage for the following reasons.

First, the distinction between what is discussed in Armitage and what is discussed in Aggarwal should be discussed. Armitage describes the generation of a label switched path. Label switched paths typically describe a path which has an ingress point, describing its input to the network, and an egress point, describing its exit from the network. (Armitage "a fixed-length label is negotiated between neighboring Label Switched Routers (LSRs) along Label Switched Paths (LSPs) from ingress to egress ..." [col. 2, lines 25-30]). Armitage describes a method for binding labels from a downstream neighbor to an upstream neighbor, where the labels are spliced together. (Armitage, "the portion of the label which is assigned by the upstream neighbor is defined as a bit mask which indicates those portions of the label which remain to be assigned by the downstream neighbor" col. 1 lines 38-41).

Aggarwal describes a method for grouping together clusters of routers into autonomous systems (AS), and assigning each AS a unique identifier. Aggarwal describes that the communication between the various AS's can be achieved by placing this identifier in the checksum field. An IP address is still communicated between the systems to identify the particular node that is being addressed. Thus, Aggarwal in essence teaches a separate field to identify the AS. In addition, at column 12, lines 26-28, Aggarwal describes "... The only remaining field of the MPLS header, the label field, may, however, be included in the Checksum in this invention... creating a new protocol as defined by MPLS is avoided, and instead the current IP header may be used to accomplish this same function ..." Thus, Aggarwal explicitly teaches away from maintaining a label field across AS boundaries.

The question is, what is a proper combination of the references? Armitage describes providing labels only from an ingress point to an egress point in the network, and the Examiner

admits Armitage does not describe providing labels across autonomous systems. As described above, Aggarwal explicitly teaches away from using labels to cross AS boundaries.

Thus, Applicant's submit that the only proper combination would result in some sort of stacked mechanism for obtaining the next node in the path, where an AS and an IP address are used to cross AS system boundaries. Such a combination neither describes nor suggests the claimed invention, and therefore the rejection under 35 U.S.C. §103 should be withdrawn.

Independent claims 6, 11, 16 and 17 recite subject matter similar to that put forth in claim 1 and are therefore allowable for reasons similar to claim 1.

Dependent claims 2-5, 7-10 and 12-15 depend upon parent claims 1, 6 and 11, respectively, add further patentable subject matter to their parent claims, and are patentable for at least the reasons put forth with regard to their parent claim.

Conclusion

Applicants have made a diligent effort to place the claims in condition for allowance. However, should there remain unresolved issues that require adverse action, it is respectfully requested that the Examiner telephone Lindsay McGuinness, Applicants' Attorney at (978) 264-6664 so that such issues may be resolved as expeditiously as possible.

For these reasons, and in view of the above amendments, this application is now considered to be in condition for allowance and such action is earnestly solicited.

Respectfully Submitted,

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CLAIMS

1. A method for establishing a label switched path across multiple autonomous systems, the method comprising:

mapping a first label from a first autonomous system to a second label in a second autonomous system;

receiving from said first autonomous system a protocol message including said first label;

replacing said first label with said second label in said protocol message; and

forwarding said protocol message to a downstream neighboring (next hop) device in said second autonomous system.

2. The method of claim 1, comprising:

establishing an incoming label switched path over said first autonomous system;

associating said first label with said incoming label switched path;

establishing an outgoing label switched path over said second autonomous system;

learning said second label associated with said downstream neighboring (next hop) device in said second autonomous system;

mapping said first label from said autonomous system to said second label in said second autonomous system;

receiving from said first autonomous system said protocol message including said first label;

replacing said first label with said second label in said protocol message; and

forwarding said protocol message to said downstream neighboring (next hop) device in said second autonomous system.

3. The method of claim 2, wherein establishing said outgoing label switched path over said second autonomous system comprises:

using a Label Distribution Protocol to set up said outgoing label switched path to a downstream neighboring border device.

4. The method of claim 2, wherein learning said second label associated with said downstream neighboring (next hop) device in said second autonomous system comprises:

establishing a Label Distribution Protocol session with said downstream neighboring (next hop) device; and

receiving said second label associated with said downstream neighboring (next hop) device in said second autonomous system via said Label Distribution Protocol session.

5. The method of claim 2, wherein mapping said first label from said first autonomous system to said second label in said second autonomous system comprises:

maintaining a label information base; and

creating in said label information base a label information base entry mapping said first label from said first autonomous system to said second label in said second autonomous system.

6. A device for establishing a label switched path across multiple autonomous systems, the device comprising:

mapping logic operably coupled to map a first label from a first autonomous system to a second label in a second autonomous system;

receiving logic operably coupled to receive from said first autonomous system a protocol message including said first label;

replacing logic responsive to the receiving logic and operably coupled to replace said first label with said second label in said protocol message; and

forwarding logic responsive to the replacing logic and operably coupled to forward said protocol message to a downstream neighboring (next hop) device in said second autonomous system.

7. The device of claim 6, comprising:

first label switched path establishing logic operably coupled to establish an incoming label switched path over said first autonomous system and associate said first label with said incoming label switched path;

second label switched path establishing logic responsive to said first label switched path establishing logic and operably coupled to establish an outgoing label switched path over said second autonomous system;

label distribution logic operably coupled to obtain said second label from said downstream neighboring (next hop) device in said second autonomous system;

mapping logic operably coupled to map said first label from said first autonomous system to said second label in said second autonomous system;

receiving logic operably coupled to receive from said first autonomous system said protocol message including said first label;

replacing logic responsive to said receiving logic and operably coupled to forward said protocol message to said downstream neighboring (next hop) device in said second autonomous system.

8. The device of claim 7, wherein said second label switched path establishing logic comprises Label Distribution Protocol logic.

9. The device of claim 7, wherein said label distribution logic comprises Label Distribution Protocol logic operably coupled to establish a Label Distribution Protocol session with said downstream neighboring (next hop) device and receive said second label associated with said downstream neighboring (next hop) device in said second autonomous system via said Label Distribution Protocol session.

10. The device of claim 7, further comprising a label information base, wherein said mapping logic is operably coupled to create in said label information base a label information base entry mapping said first label from said first autonomous system to said second label in said second autonomous system.

11. A program product comprising a computer readable medium having embodied therein a computer program for establishing a label switched path across multiple autonomous systems, the computer program comprising:

mapping logic programmed to map a first label from a first autonomous system to a second label in a second autonomous system;

receiving logic programmed to receive from said first autonomous system a protocol message including said first label;

replacing logic responsive to the receiving logic and programmed to replace said first label with said second label in said protocol message; and

forwarding logic responsive to the replacing logic and programmed to forward said protocol message to a downstream neighboring (next hop) device in said second autonomous system.

12. The program product of claim 11 comprising:

first label switched path establishing logic programmed to establish an incoming label switched path over said first autonomous system and associate said first label with said incoming label switched path;

second label switched path establishing logic responsive to said first label switched path establishing logic and programmed to establish an outgoing label switched path over said second autonomous system;

label distribution logic programmed to obtain said second label from said downstream neighboring (next hop) device in said second autonomous system;

mapping logic programmed to map said first label from said first autonomous system to said second label in said second autonomous system;

receiving logic programmed to receive from said first autonomous system said protocol message including said first label;

replacing logic response to said receiving logic and programmed to replace said first label with said second label in said protocol message; and

forwarding logic responsive to said replacing logic and programmed to forward said protocol message to said downstream neighboring (next hop) device in said second autonomous system.

13. The program product of claim 12, wherein said second label switched path establishing logic comprises Label Distribution Protocol logic.

14. The program product of claim 12, wherein said label distribution logic comprises Label Distribution Protocol logic programmed to establish a Label Distribution Protocol session with said downstream neighboring (next hop) device and receive said second label associated with said downstream neighboring (next hop) device in said second autonomous system via said Label Distribution Protocol session.

15. The program product of claim 12, wherein said mapping logic is programmed to maintain a label information base and to create in said label information base a label information base entry mapping said first label from said first autonomous system to said second label in said second autonomous system.

16. A communication system comprising a plurality of autonomous systems, each autonomous system having at least a border device that is shared with another autonomous system, wherein the shared border device links an incoming label switched path from an incoming autonomous system to an outgoing label switched path in an outgoing autonomous system.

17. An information base comprising at least one entry mapping a first label from a first autonomous system to a second label in a second autonomous system.